INTERIM MANAGEMENT MEASURES

FOR THE RED SEA CUCUMBER FISHERIES

IN SOUTHEAST ALASKA

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Division of Commercial Fisheries
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FISHERY OUTLOOK

Stock Assessment Surveys

The department will conduct dive surveys of sea cucumber densities in late September in the Sitka area and in early October near Ketchikan. These surveys will be done in the 1990/1991 rotational areas as shown in Figure 1.

Test Fishery

A pilot test fishery will be conducted to evaluate the use of commercial divers to assess stock densities. This fishery will be under contract award to a single vessel, and will take place in the 1990/1991 rotational areas near Sitka for no more than one week in late September, coinciding with the department surveys.

Commercial Fishery

The commercial fishery will open on October 14 in the Sitka area and on October 21 in the Ketchikan area, following completion of stock assessment surveys and determination of quotas based on survey results.

Openings will be 12:01 AM Sunday through 11:59 PM Monday each week until the quota is met. The fishery will be opened and closed by emergency order and managed with the miscellaneous shellfish permitting system.

Openings in the Sitka area will include all waters in the following subdistricts (Figure 1a):

113-31 (only those waters of the subdistrict north of the latitude of Aspid Cape will be open)
113-32
113-33
113-41 (only those waters of the subdistrict south of a line from Shoals Pt. on Kruzof Is. to the westernmost tip of Long Is. to the easternmost tip of Long Is. to a point on the northern entrance to Deep Inlet at 56° 59' 37" N latitude 135° 18' 40" W longitude will be open)
113-51 (only those waters in the subdistrict from Nismeni Pt. to Broad Is. and then due north to the Chichagof Is. shoreline, and northwest of a line from Pt. Moses to Lindenberg Head will be open)
113-53
113-54

Openings in the Ketchikan area will include all waters in the following subdistricts (Figure 1b):

101-43
101-53

101-85
102-30
102-70 (Thorne Bay, Tolstoi Bay, Snug Anchorage and contiguous waters will be closed south and west of a line from the northern end of Tolstoi Point at 55° 40'17" N latitude, 132° 23'37" W longitude to an unnamed point, east of Snug Anchorage, at 55° 42'07" N latitude, 132° 27'00" W longitude)

The above areas will all open at the same time; however, to avoid local overharvesting, it may be necessary to close portions of rotational areas prior to attainment of the overall quotas if catches in those portions are excessive.

All other areas will remain closed to commercial harvest of sea cucumbers until stock assessments are made and quotas are set. Requests for assessments of other miscellaneous species, including urchins and clams, will likely preclude further assessments of sea cucumber populations. Openings after January 1991 will be determined following action by the Board of Fisheries.

INTRODUCTION

This document specifies how the Alaska Department of Fish and Game will manage the commercial sea cucumber fishery in Southeast Alaska prior to adoption of permanent management regulations by the Alaska Board of Fisheries in January, 1991.

In this document we identify the specific objectives that will guide department action. Subsequently, we identify and discuss the specific management measures that will be employed. The text has been kept brief. However, the basis for many of the decisions reflected in this plan have come from extensive review of the literature, and internal department documents. Summaries of known biological information for this species, history of commercial exploitation, and assumptions and methods used to estimate harvest rate are available from offices of the Department of Fish and Game throughout Southeast Alaska, and will be included in the final management plan.

GOAL AND OBJECTIVES

Management Goal

The management goal for the Southeast Alaska sea cucumber fishery is to maximize the overall long-term benefit of sea cucumber resources to the State of Alaska and its residents, consistent with responsible stewardship for conservation of sea cucumber populations and their habitats. To attain this goal, four objectives are to be met concerning biological conservation, subsistence, sustainable and orderly fisheries, and adaptive management and research.

Biological Conservation Objective

The biological conservation objective is to ensure the long-term reproductive viability of sea cucumber populations and the quality and availability of their habitats. This objective takes precedence over other objectives that address social, economic, management, and research considerations.

To ensure the long-term reproductive viability of sea cucumber populations, management must prevent recruitment overfishing, in which spawning stocks are reduced by fishing below a level that ensures adequate production of young sea cucumbers to provide future recruits to the fishery. To maintain the quality and availability of sea cucumber habitat, harvesting methods that may destroy or damage the benthic habitats required by sea cucumbers shall be prohibited. Last, harvesting methods which substantially impact other species shall not be permitted.

Subsistence Objective

The subsistence objective is to ensure that sea cucumber harvest requirements by traditional users in coastal communities are met, as required by law. To meet this objective, management must prevent deleterious effects of commercial fisheries on the abundance and availability of local sea cucumbers stocks to subsistence users. Area closures, reduced catch quotas, or other restrictions on commercial harvest will be used to assure that traditional subsistence users are not adversely impacted.

Sustainable and Orderly Fishery Objective

The sustainable and orderly fishery objective is to ensure the conduct of manageable, steady-paced sea cucumber fisheries that provide stable employment opportunities and sustained supplies of high quality products to seafood markets. To meet this objective, management measures must be established to maintain sustainable fisheries over the long-term and prevent "boom-and-bust" or derby-type fisheries. Reporting systems should be developed to provide accurate and timely data on catch for each area. As the need arises, other regulations to promote orderly fisheries will be adopted.

Research Objective

The research objective is to conduct a fishery research program that contributes information on sea cucumber biology and population dynamics pertinent to management. This growing information base should include better data on stock abundance and distribution, including distribution with depth, so as to determine the population available for harvest.

It is also important to develop an understanding of population growth as a function of stock size so as to promote long-term sustained yield and to determine threshold population levels below which stock recovery is uncertain and no harvest should occur.

Research is also needed to determine the relationship between catch-per-unit-of-effort and stock size so as to provide an additional measure of stock abundance independent of direct surveys.

DEFINITION OF FISHERY MANAGEMENT UNITS

Sea cucumber surveys conducted by the department, tabulation of fish ticket information, and examination of logbooks over the past two years have indicated that sea cucumbers are not uniformly distributed throughout Southeast Alaska. Even in areas where they are relatively abundant, they tend to be concentrated in some areas and depths and sparsely distributed elsewhere. Responsible management strategies will have to account for local differences in stock abundance, productivity, and response to harvest.

A Fishery Management Unit (FMU) is defined as a restricted area in which sea cucumbers are likely to be subject to the same local conditions affecting their seasonal cycles and to exhibit a discrete population structure. FMU boundaries are therefore based on large-scale geographical considerations, and to the extent possible, these boundaries are set to coincide with previously established management district or area boundaries. A total of 13 FMUs have been identified for Southeast Alaska (Figure 2). Until better stock definition information becomes available, sea cucumbers within FMUs will be assumed to belong to the same stock.

MANAGEMENT MEASURES

The proposed management measures outlined below are intended to facilitate attainment of the management objectives. To the extent possible, proposed management measures incorporate existing reporting requirements, harvesting practices, and management policy. In addition, they include more stringent methods or practices deemed necessary to fully attain the management objectives.

The list of management measures to be eventually implemented is not necessarily limited to those presented below.

Permit/Reporting Requirements

Every individual wishing to commercially harvest sea cucumbers must first register their vessel and obtain a harvest permit from an office of the Alaska Department of Fish and Game. These requirements are in addition to the vessel license and interim-use permit which must be obtained from the Commercial Fisheries Entry Commission. These are current requirements for all miscellaneous shellfish fisheries conducted in state waters.

All commercial sea cucumber fishery participants must also maintain logbooks. As with registrations and permits, logbooks may be obtained from any department office in Southeast Alaska. Logbooks will permit the department to collect data on virgin population sizes and to monitor subsequent stock responses to commercial harvest. Logbooks will require catch statistics to be recorded on at least a daily basis for each location fished. Other information required includes weight of catch, depth and time fished.

Completed logbooks must be returned to the department along with the department's copy of a fish ticket. This means that each time a diver delivers his catch to a processor, he or she must be sure that the log is attached to the department's copy of the sales slip. To assure confidentiality of these records, processors will be required to seal the log books and sales slips obtained from individual divers in separate envelopes which are signed by the diver. It is the diver's responsibility to assure that this process is followed. Divers should retain a copy of their logbooks as proof of compliance with this requirement. Failure to complete and surrender logbooks is sufficient cause to revoke a diver's harvest permit.

Gear Limitations

The harvesting of sea cucumbers shall be confined to the following gear types:

1. SCUBA,
2. Tethered, umbilical, surface-supplied systems,
3. Skin/Free Diving without the aid of a breathing apparatus or diving with a snorkel only.

In order to provide a refuge below 18 meters depth, use of mixed gases or saturation diving will be prohibited. Sea cucumbers must be harvested by hand and shall be transported to the surface in bags. Any means other than individually collecting sea cucumbers by hand and placing them in bags is prohibited.

Gear limitations are important for biological conservation and long-term sustainability of the fishery. Mechanical gear, such as trawls or dredges, cause disruption of habitat and are generally unselective to species.

Fishing Seasons

The general fishing season for sea cucumbers will open on October 14 in the Sitka area and on October 21 in the Ketchikan area.

Closed Waters

Refuges

Areas closed to all commercial harvest of sea cucumbers will be established, with at least two such areas for each geographically defined stock (Figure 2). Refuges are intended to serve two primary purposes during the early years of development of the fishery. The first, and principal reason, is to meet the biological conservation objective by providing some assurance that unharvested populations remain in each stock. These populations may provide the nucleus for production of larvae for restocking adjacent areas in the event that they are inadvertently depleted.

Second, undisturbed populations in refuges will provide opportunities for research of important life history events, including spawning, migration, individual growth rates, age at sexual maturity, recruitment, mortality, and related information. Much of the current knowledge is derived from more southern latitudes, which may not accurately reflect timing or other important aspects of life histories in Southeast Alaska.

Subsistence Areas

Alaska statutes (AS 16.05.258) provide a process for the Alaska Board of Fisheries to make findings regarding the customary and traditional use of fishery resources and to provide a reasonable opportunity for preferential use by subsistence users if a harvestable surplus exists. The Board of Fisheries has determined that customary and traditional use of shellfish occurs in the vicinity of Yakutat, Klukwan, Hoonah, Angoon, Kake, Saxman, Kasaan, Craig, Klawock, and Hydaburg. These uses are interpreted to include sea cucumbers. However, the department has limited information regarding the distribution or abundance of sea cucumbers around these communities. Likewise, limited information exists regarding what impact commercial fisheries would have on subsistence use of sea cucumbers. For the purpose of these interim measures, the subsistence division of the Department of Fish and Game will review proposed commercial harvest areas for potential impacts, and recommend measures necessary to protect subsistence harvest areas and avoid adverse impacts. This process is not viewed as substitute for Board of Fisheries action, rather it is an interim measure until the Board can address the issue.

Catch Quotas

Annual catch quotas for sea cucumbers will be set to achieve the biological conservation objective by preventing overfishing. Due to limitations in our understanding of sea cucumber population dynamics and stock conditions, yield assessments will be based on a conservative application of surplus production models (Garcia et al. 1989). In comparison to other available models, this model type requires the least amount of information for estimating yield. However, the model structure is potentially overly simplistic, the parameters required are sometimes difficult to estimate accurately, and there is an attendant risk of fishery collapse (Koonce and Shuter 1987). A detailed description of the method used to apply surplus production models to estimate quotas for mostly unexploited populations is available from offices of the department around Southeast Alaska. In summary, the allowable harvest, or quota, is measured in numbers of sea cucumbers, and is calculated as a product:

$$\text{Quota} = 3 \times CF \times GF \times M \times P_0$$

where

CF = 0.4	scaling factor relating maximum sustainable fishing mortality to unexploited population size (e.g. Caddy 1986);
GF = 0.5	correction factor due to Garcia et. al (1989) to allow for errors in assumptions upon which the surplus production model is based;
M = 0.32	estimated instantaneous mortality rate for sea cucumbers using method of Hoenig (1983); and
P_0 =	virgin population size, taken as the lower bound of the one-sided 90% confidence interval.

The quota includes a factor of three to account for the three year rotational schedule (see below). The allowable quota will be three times the annual yield once every three years, to account for the two years of closure.

The product of the first four terms in the equation is 19.2%. The lower bound of the estimate of virgin population size is unlikely to be greater than 80% of the mean, so that the maximum allowable quota is

estimated at 15% of the mean value of P_0. Actual quotas may be lower depending on error in the estimate of P_0, to be determined by assessment surveys.

Population size will be estimated for each management subunit as:

$$P_0 = \text{Density} \times \text{Area}$$

where

Density = the average number of sea cucumbers per square meter of sea floor above 18 meters depth, and

Area = the total available area above 18 meters depth.

Population density will be estimated by divers censusing cucumber populations on 1 meter wide strip transects extending perpendicularly from the shore to the 18 meter depth contour. These surveys will be systematically distributed along shorelines in the proposed harvest areas. No allowance will be made in the quota for populations below 18 meters depth until scientifically valid assessments of deep populations are made.

Subtidal area will be determined by multiplying shoreline length by average width of strip transects, or by digital planimetry methods using large scale nautical charts showing the 18 meter (10 fathom) depth contour. Due to weather and sea conditions, not all areas are accessible to divers; therefore, judgements will be made regarding the area which is actually fishable when making area calculations.

Harvest Allocations and Openings

All subdistricts in Southeast Alaska open to commercial harvest of sea cucumbers are assigned to one of three rotation groups. Each group will be scheduled to open once every three years. The rotational harvest rate is calculated as three times the annual harvest rate to account for the two years of closure. Openings will be 12:01 AM Sunday through 11:59 PM Monday each week until the quota is met.

In-season Adjustments

The department may make in-season adjustments to annual catch forecasts or quotas, fishery opening dates, fishery closing dates, and closed areas. In making such in-season adjustments, the department may consider appropriate factors to the extent in-season data are available on: (1) overall fishing effort; (2) catch-per-unit-of-effort and rate of harvest; (3) status of sea cucumber stocks; (4) achievement of catch quotas; (5) spawning activity; (6) timeliness and accuracy of catch reporting; (7) adequacy of subsistence harvests; and (8) other factors that affect ability to meet the goal and objectives of this fishery management plan.

Most management measures are established prior to the start of the fishing season, including reporting requirements, gear limitations, closed waters, experimental fishing areas, annual catch forecasts/quotas, and annual allocations. However, once FMUs are opened, events may occur or new data may be collected that warrant in-season action by fisheries managers. For example, because stock assessment data on sea

cucumbers are extremely limited, in-season fishery data may provide improved estimates of population abundance. Catch quotas may need to be adjusted in-season in accordance with these new data. Other situations may arise that warrant in-season action. In all instances, in-season adjustments will be justified and reported by emergency orders available to the public.

LITERATURE CITED

Caddy, J.F. 1986. Stock assessment in data-limited situations: the experience in tropical fisheries and its possible relevance to evaluation of invertebrate resources. Pages 379 to 392 in G.J. Jamieson and N. Bourne, editors. North Pacific Workshop on Stock Assessment and Management of Invertebrates. Canadian Special Publication of Fisheries and Aquatic Sciences 92.

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Koonce, J.F., and B.J. Shuter. 1987. Influence of various sources of error and community interactions on quota management of fish stocks. Canadian Journal of Fisheries and Aquatic Sciences 44(Supplement 2):61-67.

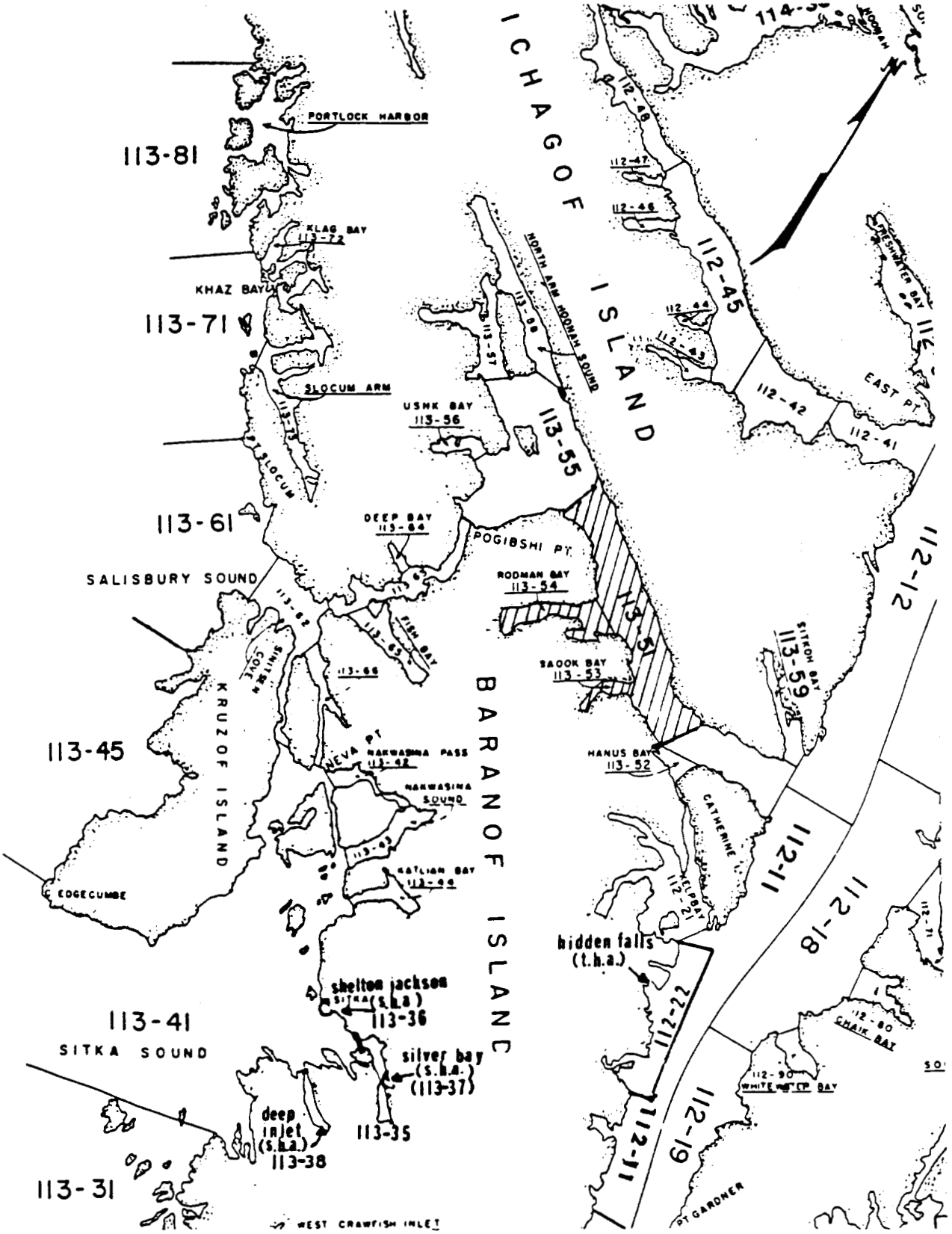

Figure 1a. Water open to commercial harvest of sea cucumbers in the Sitka area, Subdistricts 113-51, 113-53, and 113-54.

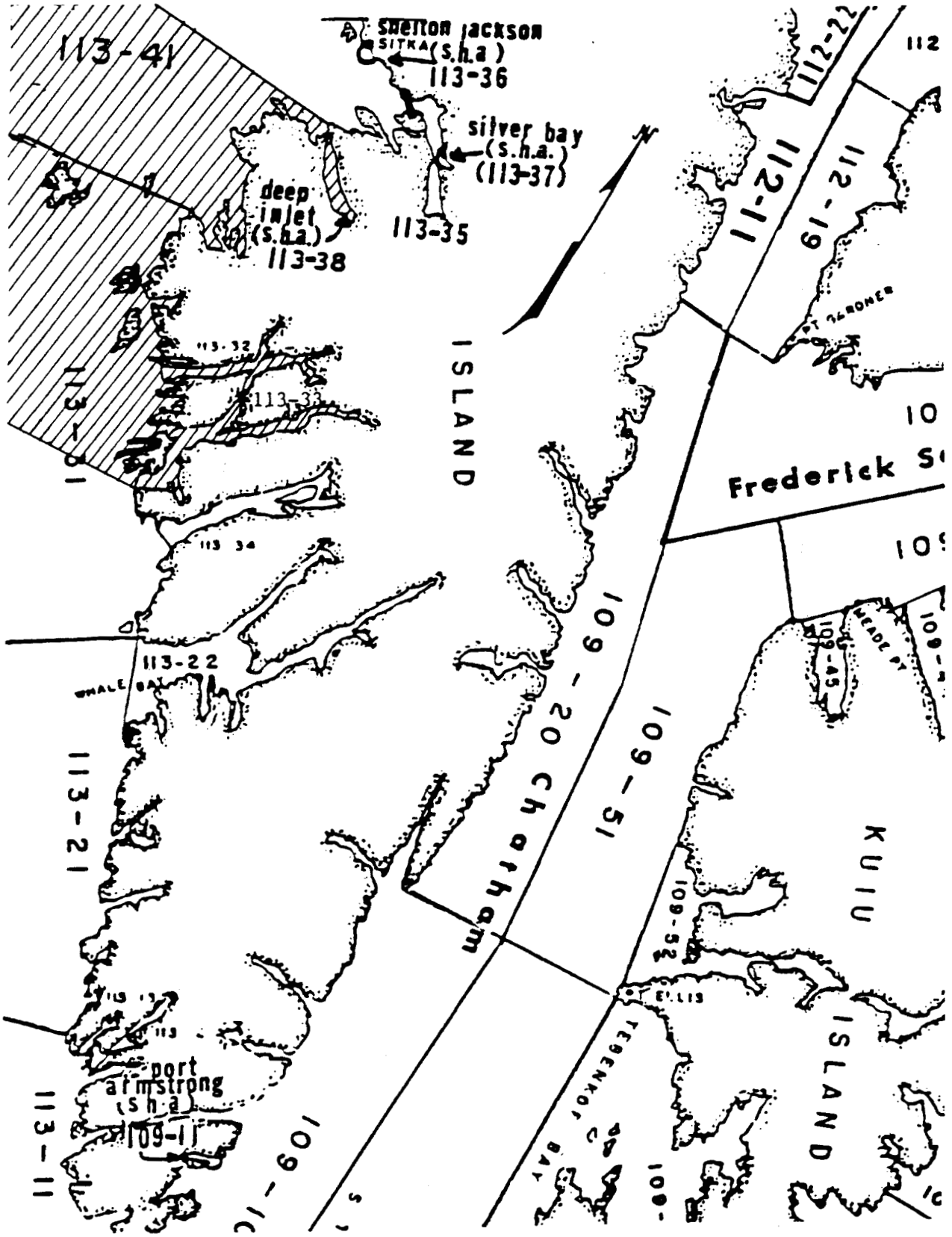

Figure 1a. Continued. Waters open to commercial harvest of sea cucumbers in the Sitka area, Subdistricts 113-31, 113-32, 113-33, and 113-41.

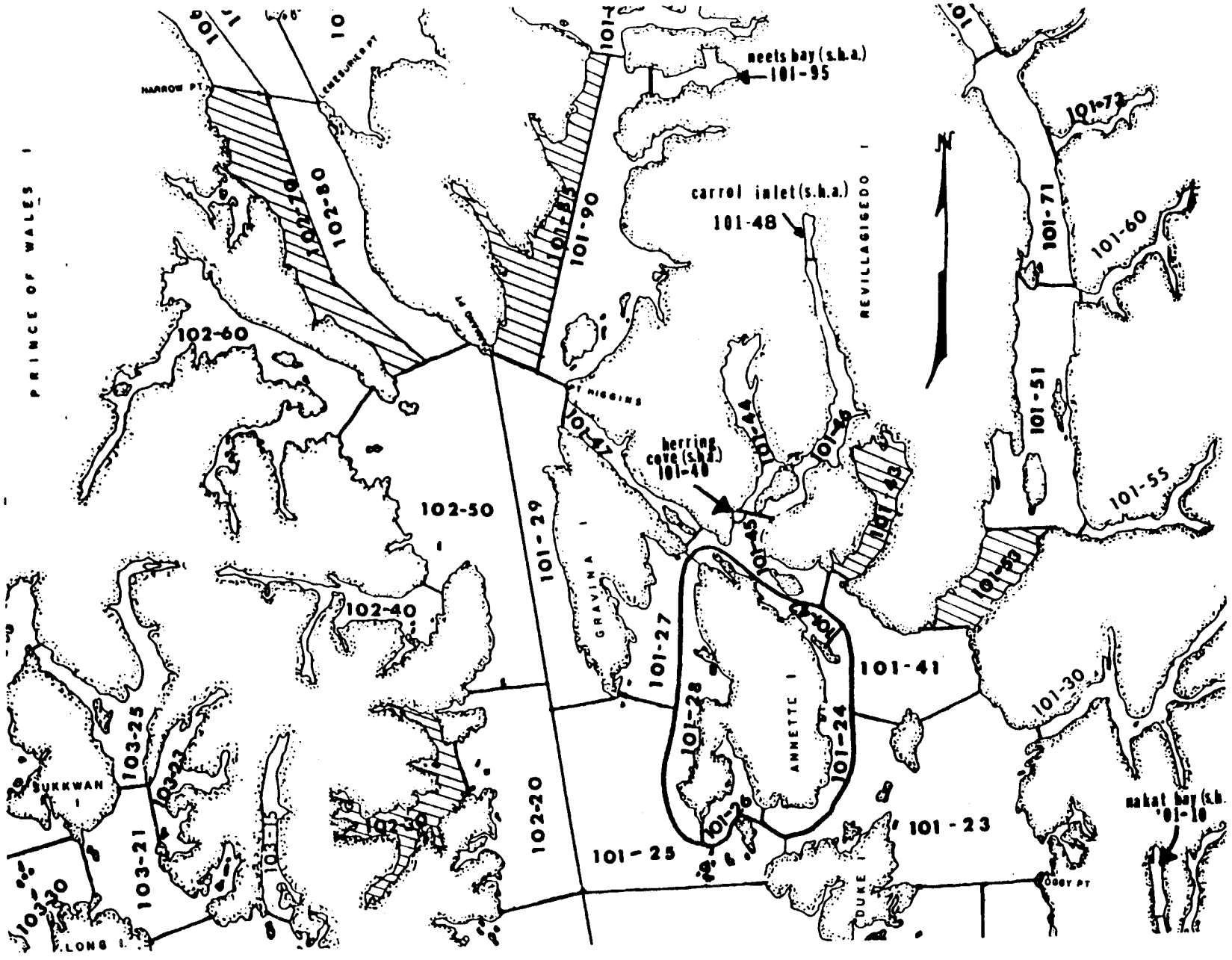

Figure 1b. Waters open to commercial harvest of sea cucumbers in the Ketchikan area in Subdistricts 101-43, 101-53, 101-85, 102-30, and 102-70.

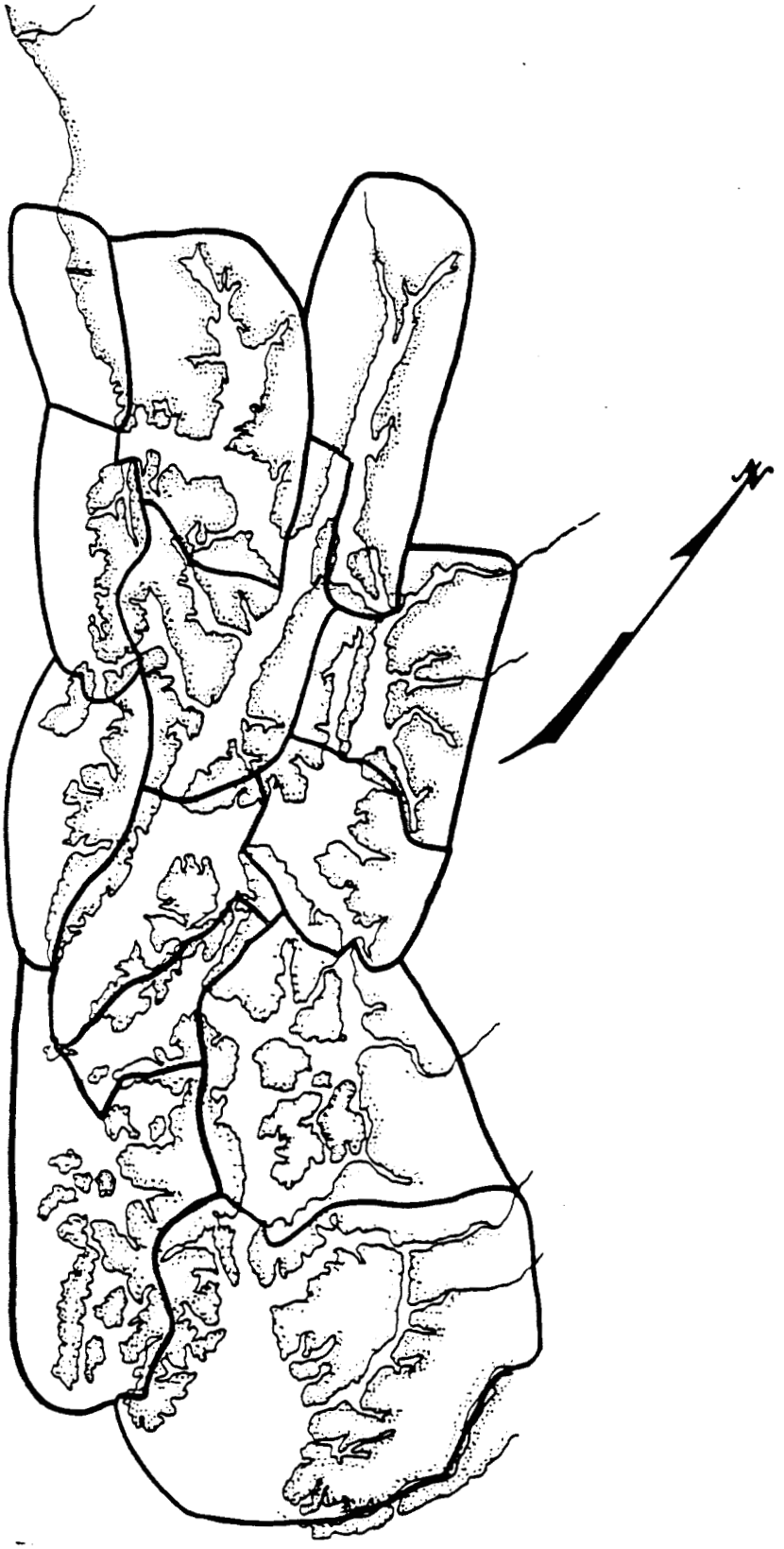

Figure 2. Fishery management unit boundaries for sea cucumbers in Southeast Alaska.